Power Roll Gin Stand Technology: Evaluation and Optimization of Rib Rail Angle and Ginning Point Modifications on a Retrofitted Lummus Gin Stand

G. A. Holt, J. W. Laird

Abstract. *Previous studies have shown the powered roll gin stand (PRGS) is capable of improving ginning rate, turnout, and fiber quality relative to a conventional gin stand; however, most of these studies used Continental Eagle gin stands, the gin stand used to develop the initial prototype and the one used in the initial field trials. Field experience in commercial gins where the PRGS technology was installed on non-Continental Eagle equipment did not always show the levels of improvement previously reported. Investigation as to the differences between the models of gin stands for which the powered roll was working and those for which it had less than desirable results revealed the primary differences were the rib rail angle and location of the ginning point. A study was conducted on a retrofitted Lummus-116 gin stand to evaluate the hypothesis that the rib rail angle and ginning point location were the reasons why the PRGS technology was not as effective on makes of gin stands other than those used to develop the technology. Results validated the hypothesis and indicated that the rib rail angle needed to be reduced by 4° and the gin point increased by 12.7 mm from the initial settings on the Lummus-116. The findings demonstrate that the initial concept of all that was needed to implement the PRGS technology on an existing gin stand was to replace the gin front was in error: the rib rail angle and ginning point location need to be considered when retrofitting any existing gin stand with PRGS technology.*

Keywords. *Cotton gin, Cotton, Gin stand, Fiber quality, Seed cotton, Gin, Ginning, Ginning rate, Turnout.*

The powered roll gin stand (PRGS) is USDA-ARS patented technology (Laird, 2000) initially developed to remove the residual fibers from cottonseed for the EASI*flo*™ process (Laird et al., 1997). Numerous studies have been conducted over the past several years demonstrating the potential of this technology to improve the efficiency of ginning seed cotton without adversely affecting fiber properties (Laird et al., 2000; Laird et al., 2001; Holt et al., 2001; Laird et al., 2002; Holt et al., 2002; Laird and Holt, 2003; Holt, 2004). In addition to ginning capacity and fiber quality evaluations, optimization studies were conducted (Holt, 2007a; Holt, 2007b; Holt and Laird, 2007) to determine the operational settings for the three primary components of the powered roll gin stand: 1) the saw, 2) the paddle roll, and 3) the seed finger roll (fig. 1).

Even though the PRGS technology can be utilized by fabricating a new gin stand, the prototype and initial field test models were obtained by retrofitting existing gin stands with new fronts that contained the powered paddle and seed finger rolls as depicted in figure 1. The new fronts were more than the addition of new components; they included different dimensions and spacing of critical components such as the size of the roll box (Holt, 2007b). The initial prototype model, located at the United States Department of Agriculture-Agricultural Research Service (USDA-ARS), Cotton Production and Processing Research Unit (CPPRU) in Lubbock, Texas, showed promising results that prompted the conversion of the first commercial unit, a Continental Double Eagle 141 that was installed at Servico, Incorporated's gin in Courtland, Alabama. The initial testing and evaluation performed in 2002 resulted in all three of Servico's gin stands being converted. Askew et al. (2004) documented Servico's experience evaluating and operating the PRGS in a commercial cotton gin. The information and results obtained during the installation and evaluation at Servico prompted

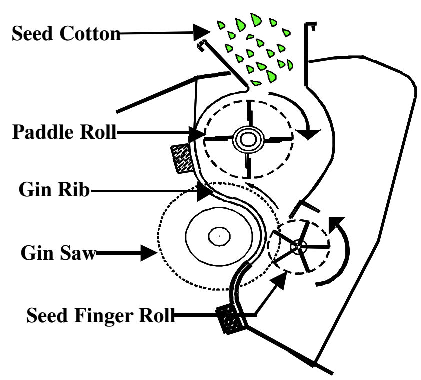

Figure 1. Schematic showing the primary components of the powered roll gin stand.

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other gin stand conversions at other cotton gins. In spite of the success and experience gained at Servico, other conversions had their own unique installation and operational challenges. One of the main challenges was the operation of this technology on makes of gin stands that differed from the original Continental Eagle models used to develop the prototype and those which were operated at Servico, Inc.

One make of gin stand, Lummus, which was retrofitted with the PRGS technology, was evaluated at three locations: Minturn CO-OP (Chowchilla, Calif.), Roscoe CO-OP (Roscoe, Tex.), and Coastal Plains Gin (Mathis, Tex.). The production rate, fiber properties, and turnout results from these retrofitted Lummus gin stand studies showed promise but revealed an unexplained inconsistency in performance. Separate from any mechanical issues resulting from manufacturing problems, the retrofitted gin stands would outperform the conventional (i.e. non-retrofitted) gin stand in one test, and then the two would perform identically in the next test. This inconsistency in performance relative to the existing gin stands coupled with manufacturing problems that were occurring with some of the earlier units, resulted in the decision of some of the initial cotton gins evaluating the PRGS technology to stay with their existing gin stands, since there did not appear to be a definitive advantage to implementing the technology. The inconsistency in performance of the retrofitted Lummus gin stands at Minturn, Roscoe, and Coastal Plains could have been attributed to several factors: 1) differences in the gin stands ascribed to the original equipment manufacturer (OEM) (i.e. larger seed roll box, variations in spacing and settings, etc.), 2) different versions of the same model gin stand that had been modified either by a third party or the OEM, and/or 3) the PRGS was not tuned-in to this make of gin stand. These factors contributed to the hypothesis that the PRGS technology would only work on one make of gin stand, the Continental Eagle.

When investigating why the PRGS technology appeared to perform better on one make of gin stand than others, it became evident that the primary difference between the gin stands that were working consistently and those that were not was the angle of the ginning ribs and the location of the ginning point. Thus two studies were conducted with the following objectives: 1) to evaluate whether there are other gin rib configurations (i.e. rib angle and placement) in a retrofitted Lummus PRGS that display better performance characteristics (i.e. gin rate, turnout, and fiber quality) than the "initial" retrofitted Lummus PRGS; and 2) if the initial evaluation reveals other promising configurations, to determine the optimal configuration to be used when retrofitting a Lummus gin stand with the PRGS technology.

Materials and Methods

Two studies were performed. The first study evaluated whether alternative rib angles and placements would improve the performance of a Lummus gin stand retrofitted with PRGS technology versus a retrofitted Lummus gin stand that was configured the same as previous field models with the original rib rail angle and placement. The second study focused on optimizing rib angle and placement (i.e. the ginning point) of the retrofitted Lummus gin stand. Both studies were performed on the second generation prototype PRGS at the CPPRU in Lubbock, Texas. The second generation prototype involved retrofitting a Lummus 116-saw gin stand with the PRGS technology. Specific details of the modifications made in retrofit are found in Holt (2007b). The operational settings of the PRGS components in both studies were: 1) paddle roll speed = 208 rpm, 2) paddle roll load = 17.5 amps, 3) saw speed = 830 rpm, and 4) seed finger speed = 26.4 rpm. Testing was performed using a single variety (Paymaster 2326) that had been stripper harvested without a field cleaner. Seed cotton moisture samples were collected at the feeder apron and moisture content was determined by the procedure developed by Shepard (1972). Lint samples were collected before and after lint cleaning and analyzed using High Volume Instrumentation (HVI) and Advanced Fiber Information System (AFIS) at Cotton Incorporated's facility in Cary, North Carolina. Three moisture and lint samples were taken for each run. The sequencing of the precleaning and lint cleaning equipment was identical for all test runs: Steady-Flo, tower drier, 6-cylinder incline cleaner (HE 1108-B), extractor (Lummus S&GH), tower drier, 6-cylinder incline cleaner (HE 1108-B), extractor (Consolidated Rescuer 320), distributing conveyor, feeder (Lummus 400), PRGS, lint cleaner (HG 66), and press. The tower driers were in the process flow but were not operational during testing.

Study 1: Experimental Setup

Modifications to the gin stand were accomplished by inserting a combination of spacers behind the rib rail and changing out the guide roller wheels with wheels of varying diameter (fig. 2). The combination of spacers and guide roller wheel diameters were used to alter the rib rail angle and the ginning point. Table 1 shows how the combinations of spacer thickness and guide roller wheel diameter were used to obtain different ginning points and rib angles for the six treatments, hereafter referred to as setups, evaluated in this study. It should be noted that all potential combinations shown in table 1 were not possible due to combinations that resulted in

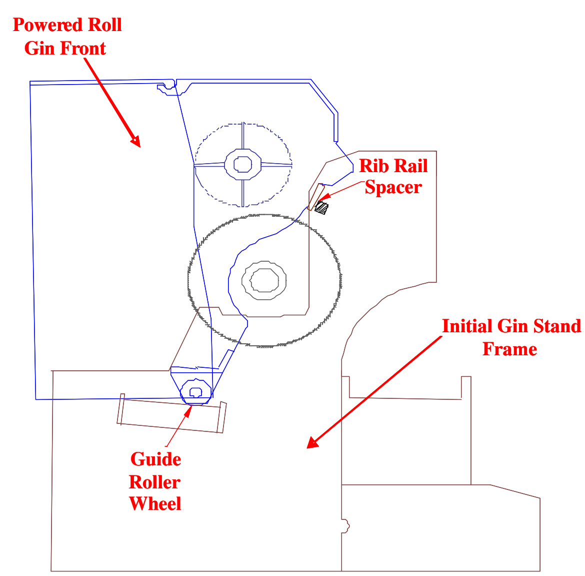


Figure 2. Schematic side-view showing the locations where modifications (rib rail spacers and guide roller wheels) were made on the second generation powered roll gin stand for Studies 1 and 2.

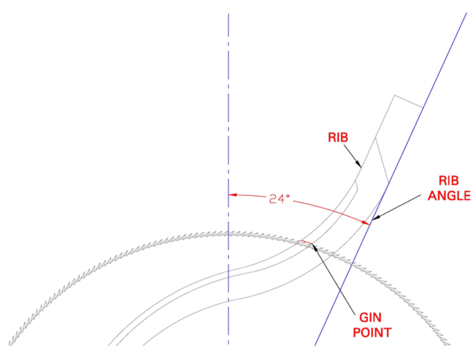
Table 1. Rib rail spacer thickness and guide wheel diameter combinations showing rib rail angle and gin point location for the six treatments evaluated, in Study 1, on a retrofitted Lummus-116 powered roll gin stand.

Diameter of Guide Roller Wheel (mm)	Rib Rail Spacer Thickness (mm)			
	0	13	25	38
60	Setup 1 (Original)[a]			
43		Setup 2	Setup 3	Setup 4
30			Setup 5	Setup 6

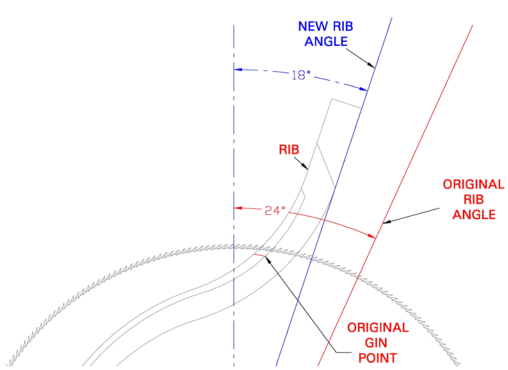
Gin Point Distance Below Slot in Rib (mm)	Rib Angle from Vertical (degree)			
	24	22	20	18
43	Setup 1 (Original)			Setup 4
36			Setup 3	
33		Setup 2		Setup 6
28			Setup 5	

[a] Original = A Lummus 116 gin stand that had been retrofitted with the powered roll gin stand technology with the rib rail angle and gin point the same as they originally were prior to installing the new powered roll gin stand front.

the gin stands ribs rubbing against the saw mandrel (i.e. the shaft on which the gin saws are mounted) therefore, only the set of combinations that could be obtained without operational limitations were evaluated. Figure 3 shows illustrations of how the combinations of spacers and guide roller wheel diameters influenced rib angle and gin point for two setups.



Setup 1 (Original)



Setup 6

Figure 3. Schematics illustrating the gin saw passing between gin ribs and how the combinations (setups) of rib rail spacers and guide roller wheel diameters influenced rib angle and gin point for two of the six setups evaluated in Study 1.

Study 2: Experimental Setup

Modifications were made using the same procedure as described for Study 1 but with different combinations of spacers and guide rollers. Table 2 shows the spacer thickness and guide roller wheel diameter combinations used to obtain different ginning points and rib angles for the nine treatments evaluated in this study. Figure 4 shows two illustrations of how the combinations of spacers and guide roller wheel diameters influenced rib angle and gin point. The selection of roller wheel diameters and rib rail spacers used for the second study were based on combinations that included some of the settings from Study 1 (i.e. rib angle) but allowed for all the design points to be obtained (i.e. center point, axial points, and factorial points) without the operational limitations encountered in the first study.

Data Collection and Analysis

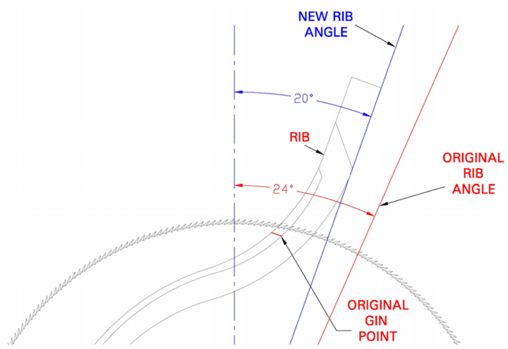
The response variables for both tests were: ginning rate, turnout, HVI length, HVI uniformity index, HVI reflectance (Rd), HVI yellowness (+b), HVI leaf grade, AFIS length by weight, AFIS length by number, AFIS short fiber content by weight and number, AFIS nep size, AFIS nep count, AFIS seed coat nep size, AFIS seed coat nep count, AFIS visible foreign matter, AFIS trash count, visible mechanical damage, lint loss, reginned lint, and loan value.

The seed analysis data, visible mechanical damage (VMD), and lint loss were obtained from Delta and Pine Lands laboratory (Aiken, Tex.). VMD is one means of evaluating ginning effectiveness in terms of seed quality. The seeds were acid-delinted and are evaluated for damage, classifying into one of three levels of severity. The sum of all three levels is termed total VMD and is the value used in this study. The VMD analysis was performed as described by McCarty and Baskin (1978). Lint loss refers to the amount of lint still remaining on the seed after ginning and was measured by weighing out a predetermined amount of seed, drying the seed, acid-delinting, drying the seed again, and then re-weighing the delinted seed. Lint loss was reported in percentage of seed weight. Regin lint was similar to lint loss except the seeds were reginned on a bench-top saw gin stand instead of being acid-delinted. The procedure involves

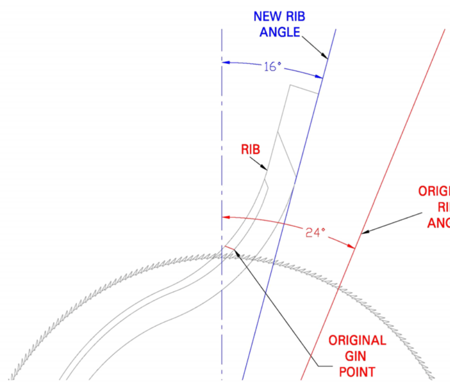
Table 2. Rib rail spacer thickness and guide wheel diameter combinations showing rib rail angle and gin point location for the nine setups evaluated, in Study 2, on a retrofitted Lummus-116 powered roll gin stand .

Diameter of Guide Roller Wheel (mm)	Rib Rail Spacer Thickness (mm)		
	25	34	43
33	Setup 1	Setup2	Setup 3
38	Setup 4	Setup 5	Setup 6
43	Setup 7	Setup 8	Setup 9

Gin Point Distance Below Slot in Rib (mm)	Rib Angle from Vertical (degree)			
	20	19	18	16
43				Setup 9
41			Setup 8	
39				Setup 6
36	Setup 7	Setup 5		
34				Setup 3
33	Setup 4	Setup 2		
31	Setup 1			



Setup 1



Setup 6

Figure 4. Schematics showing the gin saw passing through the ribs and how the combinations (setups) of rib rail spacers and guide roller wheel diameters influenced rib angle and gin point for two of the nine setups evaluated in Study 2.

weighing out a predetermined quantity of seed, ginning the seed on the bench-top gin stand, weighing the reginned seed, and weighing the lint. Both lint loss and regin lint are metrics used to quantify the ginning efficiency at the seed level. The more lint recovered, the lower the ginning efficiency.

Study 1

Six setups were evaluated in this study (table 1). There were three replications of each treatment for a total of 18 runs. For each run, one moisture and three lint samples were collected. The experiment was arranged as a complete randomized design. Standard analysis of variance techniques were used to analyze the data using the Ryan-Einot-Gabriel-Welsch multiple range test to determine significant differences between the treatments at the 95% confidence interval (SAS, 2005).

Study 2

Based on findings from Study 1, response surface methodology was used to evaluate the optimal location of the rib rail on the Lummus prototype PRGS. Nine gin front setups were evaluated (table 2) using a face-centered central-composite design (FCD), blocked by day, to perform 22 runs (11 each day). The FCD contained two independent variables (spacer thickness and guide roller wheel diameter) and 20 response variables. The response variables included fiber properties obtained from HVI and AFIS analyses, seed analysis data, and production data. Model coefficients for the individual response variables were determined using the backward elimination procedure and hierarchy principle. The level of significance was set at 10% with the optimization analysis performed using desirability functions (Derringer and Suich, 1980). The design of the experimental analysis was conducted with Design-Expert software (Stat-Ease, Inc., Minneapolis, Minn.)

Results

Study 1

The average moisture content of the seed cotton was 8.07% with a standard deviation of 0.57%. Moisture content was not significantly different due to treatment or replication. Table 3 contains select means from the HVI, AFIS, and loan value response variables based on samples taken before lint cleaning. None of the response variables evaluated were significant, based on before-lint-cleaning data, at the 95% confidence limit. The variables chosen for table 3 are those most commonly referenced when evaluating the influence of machinery on cotton. The HVI data shown in table 3 contains the variables that influence loan value that can be significantly impacted by the gin stands performance.

Even though the before-lint-cleaning data was not significant, the data illustrates the importance of taking a holistic approach to evaluating the influence the setups had on the response variables when compared with table 4. Table 4 shows the same select variables as table 3 with the addition of ginning rate and regin lint. Table 4 is based on fiber data obtained after one stage of lint cleaning. The factors with significant differences at the 95% confidence limit were gin rate, regin lint, nep size, and leaf grade. While nep size and leaf grade showed significant differences between the setups, the most notable significant responses were ginning rate and regin lint. The data revealed the highest ginning rate to be with Setup 5 (7.4 bales/h) and the lowest was with the original setup (6.06 bales/h). The statistically different and higher ginning rates provided evidence that the PRGS technology can be effective on a Lummus Gin stand. The reginned lint variable indicated significant differences in lint removal from the seed for several treatments. The original setup showed good lint removal with the second lowest average as did Setup 2 which had the lowest average. Setup 5 had a higher residual lint average than did any other treatment. The findings of this study imply that some of the less than desirable results experienced in previous studies (i.e. no increase in ginning rate or turnout) of some of the retrofitted Lummus field models were more likely a product of improper alignment of the rib rail and gin point than the PRGS technology. Results from this test prompted a second test in which the objective was to determine the optimal setup for the rib rail and gin point using the prototype Lummus-116 PRGS.

Study 2

The average moisture content of the seed cotton was 6.88% with a standard deviation of 0.60%. Moisture content was not significantly different due to treatment or replication. The data presented in this report is based on fiber data from lint samples collected after lint cleaning. The before lint cleaning fiber quality data did not yield any significant models for optimization analysis. Regression analysis, of the

Table 3. Mean High Volume Instrument (HVI) and Advanced Fiber Information System (AFIS) fiber property data from Study 1, based on samples taken before lint cleaning, from the six combinations of rib rail angle and gin point evaluated on a retrofitted Lummus-116 powered roll gin stand.

Response Variable	Units	Treatments					
		Setup 1 (original)	Setup 2	Setup 3	Setup 4	Setup 5	Setup 6
Production and Loan Value Data							
Loan Value	$	0.468	0.478	0.483	0494	0.472	0.472
HVI Fiber Data							
Length	cm	2.77	2.74	2.77	2.77	2.76	2.78
Uniformity	%	81.4	81.2	80.7	80.9	81.4	80.8
Reflectance		65.7	65.4	67.4	67.7	65.0	65.5
Yellowness		8.6	8.5	8.3	8.2	8.5	8.6
Leaf Grade		4.7	4.0	4.7	4.7	4.7	5.0
AFIS Fiber Data							
Nep Size	um	702	718	703	700	704	703
Neps	cnt/g	283	310	301	289	294	281
Lw	cm	2.35	2.34	2.31	2.32	2.34	2.34
UQL	cm	2.90	2.88	2.86	2.89	2.92	2.91
SFC	%	11.0	11.6	12.0	11.9	12.6	12.5
SCN	cnt/g	24.7	32.0	24.7	26.3	28.3	27.0

Table 4. Mean production, High Volume Instrument (HVI) and Advanced Fiber Information System (AFIS) fiber property data from Study 1, based on samples taken after one stage of lint cleaning, from the six combinations of rib rail angle and gin point evaluated on a retrofitted Lummus-116 powered roll gin stand.

Response Variable	Units	Treatments[a]					
		Setup 1 (original)	Setup 2	Setup 3	Setup 4	Setup 5	Setup 6
Production and Loan Value Data[b]							
Gin rate	bales/h	6.06d	6.83b	6.63bc	6.21cd	7.40a	6.68bc
Regin lint[c]	%	0.474b	0.456b	0.532ab	0.832a	0.552ab	0.731ab
Loan value[d]	$	0.525	0.533	0.53	0.511	0.512	0.528
HVI Fiber Data[b]							
Length	cm	2.72	2.74	2.72	2.69	2.69	2.72
Uniformity	%	80.2	80.4	80.3	79.6	80.4	80.6
Reflectance		72.2	70.67	73.53	70.1	71.93	72.8
Yellowness		8.7	8.6	8.3	8.8	8.4	8.5
Leaf grade		3.0ab	3.0ab	3.0ab	2.3b	3.3a	3.0ab
AFIS Fiber Data[e]							
Nep Size	um	698 ab	703 ab	698 ab	685 b	693 ab	713 a
Neps	cnt/g	380	379	381	350	369	360
Lw	cm	2.34	2.35	2.33	2.35	2.36	2.34
UQL	cm	2.88	2.9	2.87	2.9	2.91	2.89
SFC	%	11.5	10.7	11.3	10.7	10.7	11.1
SCN	cnt/g	21.0	29.3	24.7	22	26.3	24.3

[a] Setups, in Study 1, obtained by inserting spacers behind the rib rail and by replacing the guide rollers with rollers of different diameters. Setups 2 through 5 resulted in different rib angles and gin points compared to Setup 1 (original).
[b] Means within the same row followed by different letters are significant at the 95% confidence limit.
[c] Regin lint = lint obtained from reginning the seed collected after the initial ginning. The more lint remaining on the seed the poorer the quality of ginning. Measured in percent of seed weight.
[d] Loan value calculated from the 2007-08 CCC loan chart for Lubbock, Texas.
[e] Means within the same row followed by different letters are significant at the 95% confidence limit. Lw = Length by weight, UQL = Upper quartile length, SFC = Short fiber content, SCN = Seed coat neps.

after lint cleaning fiber quality data, produced fitted models to seven response variables: 1) ginning rate, 2) reginned lint (residual lint), 3) HVI Length, 4) Short Fiber Content by weight (SFCw), 5) AFIS Length by number (Ln), 6) Short Fiber Content by number (SFCn), and 7) Seed Coat Nep Size. Table 5 shows the mean, standard deviation, R-Squared, significant model terms, and signal-to-noise ratio for the seven response variables yielding models. The signal-to-noise ratio is a metric that indicates whether or not there is adequate model discrimination of the response variable to noise. A ratio value greater than 4 is desirable (Whitcomb et al., 2003). Normally in a ginning test, ginning rate would

Table 5. Study 2 model analysis data for the ginning rate, reginned lint, HVI length, AFIS short fiber content by weight, AFIS length by number, AFIS short fiber content by number and AFIS seed coat nep size response variables for the retrofitted Lummus-116 gin stand based on lint samples collected after one stage of lint cleaning.

Response Variable[a]	Units	Model Data[b] Mean	RMSE	R^2	Model Terms[c]	S/N Ratio
Ginning rate	bales/h	7.52	0.21	0.667	S^2, RS^2	7.3
Reginned lint	%	0.193	0.13	0.858	S, S^2	14.1
HVI length	cm	2.67	0.01	0.383	RS, R^2	9.2
Short fiber content (w)	%	8.10	0.47	0.409	R, R^2	8.0
AFIS length (n)	cm	2.92	0.02	0.371	R, R^2	7.3
Short fiber content (n)	%	24.6	1.10	0.456	R, R^2	6.9
Seed coat nep size	um	1074	45.2	0.377	R, R^2	5.8

[a] Reginned lint = the percent of lint recovered off of the seed after ginning, a lower percentage is desirable and indicates cleaner seed. (w) = by weight. (n) = by number (i.e., by count).
[b] RMSE = root mean square error, S/N = signal-to-noise.
[c] Only statistically significant terms ($p \leq 0.1$) in the models are shown. S = Spacer thickness, R = guide Roller diameter

be held relatively constant. In this test, the operation of the gin stand was regulated by a closed-loop control system which operated with a paddle roll set point of 17.5 amps therefore variations in ginning rate were due to the "ease of ginning" experienced by the gin stand. The reginned lint response variable is an indication of the cleanliness of the seed (i.e. less lint means better cleaning of the seed). The other five response variables producing fitted models are associated with fiber quality measurements.

The only response variables that were deemed acceptable for use in the optimization analysis, based on R^2 values, were ginning rate and reginned lint. With the exclusion of all the response variables except ginning rate and reginned lint, the optimization was based on variables that are not dependent on lint cleaning since these response variables are production parameters of the system and not fiber properties which are influenced by lint cleaning. The significant model terms for ginning rate were spacer thickness squared (S^2) and the interaction of guide wheel roller diameter and spacer thickness squared (RS^2). The regined lint response variable had two significant model terms, S and S^2. Figures 5 through 7 show the graphs for ginning rate, reginned lint, and desirability, respectively. The desirability shown in figure 7 was obtained using the procedure described by Derringer and Suich (1980) which involved an objective function containing the ginning rate and reginned lint response variables. The x- and y-axes in figures 5 and 7 are reversed in order to better illustrate the curvature of the response surface.

Figure 5 shows that at the smaller wheel roller diameter the ginning rate increased as the spacer thickness either increased or decreased from 34.1 mm. However, the opposite was true at the higher wheel diameter. Figure 6 shows the influence of spacer thickness on residual lint. The smaller the spacer, the lower the amount of residual lint left on the seed regardless of the roller diameter. Figure 7 shows that the most desirable configuration among those considered, based on the ginning rate and reginned lint response variables, would be Setup 1 in figure 4 (a roller wheel diameter of 32.5 mm and a spacer thickness of 25.4 mm).

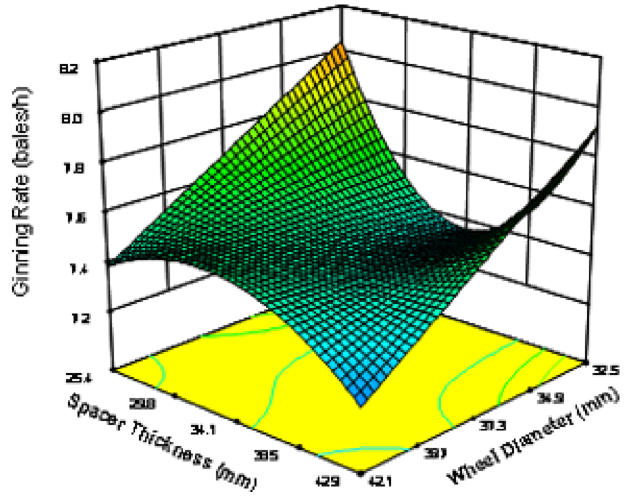


Figure 5. Three-dimensional graph for ginning rate over the range of spacers and guide roller wheel diameters evaluated. X- and y-axes reversed in order to better illustrate curvature of the response surface.

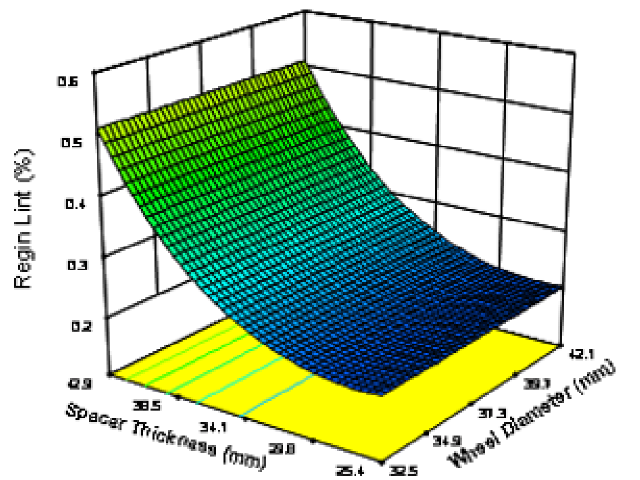


Figure 6. Three-dimensional graph for reginned lint (residual lint) over the range of spacers and guide roller wheel diameters evaluated. X- and y-axes reversed in order to better illustrate curvature of the response surface.

The results of the second study verify the findings of the first study. The best setup in the first study was with a spacer thickness of 25.4 mm and a roller wheel diameter of 30.0 mm. The optimization analysis revealed the optimal roller wheel diameter and spacer diameter to be at the edge of the design space. Additional studies should be conducted to narrow the design space as much as possible around the optimal setup found in this study to validate the findings. One of the main limitations that needs to be considered for any additional study is making sure that a design space centered on a wheel diameter of 32.5 mm and a spacer thickness of 25.4 mm can be obtained without the ribs rubbing against the saw mandrel, since rubbing against the saw mandrel was one of the problems encountered in the first study that limited the number of combinations evaluated. Lastly, items such as rib curvature, roll box dimensions and configuration, and paddle and seed finger roll placement are items that warrant further investigation to understand the overall influence they could have on improving the performance and optimization of the PRGS technology.

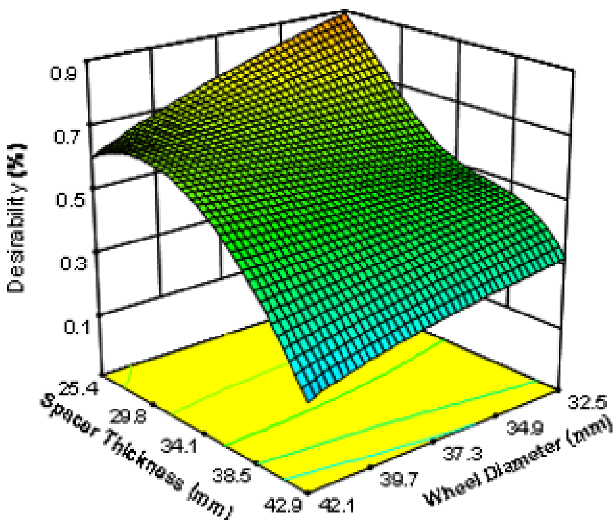


Figure 7. Three-dimensional graph for desirability over the range of spacers and guide roller wheel diameters evaluated. X- and y-axes reversed in order to better illustrate curvature of the response surface.

Conclusions

Problems encountered in retrofitting the powered roll gin stand technology on makes and models of gin stands other than Continental Eagle gin stands led some to hypothesize that the technology only worked on Continental Eagle gin stands and that it could not be successfully implemented on other makes and models. Further investigations into what differences might exist between the retrofitted models that were working as desired and those that were not working revealed the angle of the rib rail and the ginning point as possible problem areas. One of the main assumptions in the initial installations of the technology was that the only component of the existing gin stands that needed to be changed was the gin front; the rib rail and the angle of the ribs could be left as they were originally designed. Findings from two studies conducted on a Lummus-116 that was retrofitted with the PRGS technology revealed that the initial assumption of leaving the rib rail and ginning point the same for all models was in error. Results indicated the rib rail angle needed to be decreased by four degrees and the gin point moved up on the rib 12.7 mm for the Lummus-116 gin stand evaluated. The power roll gin stand technology has promising potential to improve the operation of a gin stand, however, a better understanding of how the PRGS components influence production and fiber quality parameters needs to be gained especially when retrofitting the technology onto existing gin stands.

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